199620US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

HIROSHI YOKOGAWA ET AL : EXAMINER: YUN, JURIE

SERIAL NO. 09/708,657 :

FILED: NOVEMBER 9, 2000 : GROUP ART UNIT: 2882

FOR: SUBSTRATE FOR LIGHT EMITTING DEVICE, LIGHT EMITTING DEVICE AND PROCESS FOR PRODUCTION OF LIGHT EMITTING DEVICE :

DECLARATION UNDER 37 C.F.R. §1.132

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Now comes _____ who deposes and states:

1. That I am a graduate of_____

and received my _____ degree in the year _____.

2. That I have been employed by_____

_____ for _____ years as a _____

in the field of _____.

3. That I am an inventor in the above-identified application, and I am familiar with its contents.

4. That I have read and understand the references to Hora, Hunter et al, and Hinotani et al, which have been cited against the present application.

5. That Hora discloses, as a material for the low refractive index member (4), a fluorine resin and an organic resin. The fluorine resin as disclosed in Hora is estimated to have a refractive index of 1.35 to 1.41, and also that the organic resin as disclosed in Hora is estimated to have a refractive index of 1.39 to 1.57. The above estimations are based on the following and the accompanying attachments:

5a. As to the fluorine resin, Chemical Handbook (edited by Chemical Society of Japan, published by Maruzen), page II-518 is attached as Table A, which describes that tetrafluoroethylene resin has a refractive index of 1.35. Further, Optoelectronics Material Manual (edited by Optoelectronic Industry and Technology Department Association), published by The Optronics Co., Ltd., page 49 is attached as Table C, which explains that α-fluoro-acrylate polymer has a refractive index of 1.37 to 1.41.

5b. As to the organic resin, Hora discloses, as examples thereof, cyanoethylpullulan and cyanoethylcellulose. It is noted that these resins are incorrectly typed in Hora (col. 1, line 33), and these resins are based on the counterpart Japanese application. Although no data of the refractive indexes of these cyanoethylpullulan and cyanoethylcellulose resins is available, but pullulun and cellulose have formulas as shown in attached Table D and Table E, respectively, both of which are obtained from URLs though the internet, noted in the attachments. Chemical structures of pullulun and cellulose are similar to that of sucrose, whose structure is shown in attached Table F (also obtained from URL though the internet). Chemical Handbook, page 11-518 (attached Table A) already discussed shows that sucrose has a refractive index of 1.54 to 1.57. On the other hand, a cyanoethyl group seems to be induced from cyanoethylene, and cyanoethylene has a refractive index of 1.39 according to Merck Index (13th edition), page 25 (attached Table G). Therefore, the refractive indexes of cyanoethylpullulan and cyanoethylcellulose are roughly expected to be 1.39 to 1.57.

6. Hinotani et al disclose, as a material for the low refractive index member (19), silicon dioxide (SiO_2). It is generally known that SiO_2 has a refractive index of about 1.45 to 1.48, which is said to be well-known to those skilled in the art. In support, Optoelectronics Material Manual, page 48 is attached as Table B, which explains that the glass has a refractive index of 1.46 to 1.96. It is noted that the refractive index of SiO_2 depends on the method by which SiO_2 is produced, and therefore the refractive index range in Table B is broader than the well-known range.

7. It is generally known to those skilled in the art according to the classical optics that not all of the light passes from a higher refractive index material into a lower refractive index material through an interface between those materials due to the critical angle for the total reflection of the light. When a difference between the refractive indexes of those material is larger, a quantity of light which is reflected by the interface becomes larger.

7a. Based on the above general knowledge, those skilled in the art contemplate that a quantity of light which is reflected by the interface would be increased if a refractive index of the member (1) is so low as in the range 1.0 and 1.3, which is considerably lower compared with a refractive index of the electrically conductive transparent film (2) made of for example ITO. For example, a refractive index of ITO is about 1.8 to 2.1 depending on the method that ITO is produced. Therefore, in the case of the substrate as claimed, those skilled in the art would of course expect that a quantity of light withdrawn would be decreased.

7b. In the case of a non-planar light emission device such as LED, those skilled in the art have tried to increase a quantity of light to be withdrawn by providing a convex lens adjacently to the LED. Upon such trials, they have used materials for the lens which have a large refractive index as much as possible.

7c. Therefore, those skilled in the art would not reduce the refractive index of the member which is adjacent to the conductive transparent film (2) as claimed. It is thus surprising and unexpected that the present invention in which the low refractive index member is provided improves the external efficiency.

8. There are 10 pages of attachments accompanying this Declaration, incorporated herein in their entireties.

9. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

10. Further deponent saith not.

_____

Signature

_____

Date